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REPRODUCTION DEVICE AND METHOD, RECORDING MEDIUM, AS WELL AS
SIGNAL PROCESSING DEVICE AND SIGNAL PROCESSING METHOD

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REPRODUCTION DEVICE AND METHOD, RECORDING MEDIUM, AS WELL AS
SIGNAL PROCESSING DEVICE AND SIGNAL PROCESSING METHOD

[Saisei shochi oyobi hoho, kiroku baitai, narabini shingo kyori sochi oyobi shingo kyori hoho]

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[There are no amendments to this patent.]

Claims

/2*

1. A type of reproduction device characterized by the fact that it has
a read means for reading the overlapped signal from a recording medium that has said
overlapped signal obtained by overlapping the same copyright information on two or more
channels by means of electronic watermark processing, recorded with respect to the original
signal for the contents having plural channels,
a reproduction means that generates the reproduction signals of the channels from said
read overlapped signal,

* [Numbers in right margin indicate pagination of the original text.]

a copyright information detecting means that detects said copyright information of the channels from the generated reproduction signals,

and a control means that outputs the reproduction signals of the channels when said copyright information detected with said copyright information detecting means is the same for said two or more channels.

2. The reproduction device described in Claim 1 characterized by the fact that said read means reads said overlapped signal from the recording medium that has the overlapped signal obtained by overlapping the copyright information containing the same copying control information on at least the video channel and audio channel by means of the electronic watermark processing, recorded on it.

3. The reproduction device described in Claim 2 characterized by the following facts:
it has a [recording] medium detecting means that detects whether said recording medium is read-only;

and said control means controls output of the reproduction signal of each channel based on the results of detection of said medium detecting means and said copyright information detecting means.

4. A reproduction method characterized by the following facts:
from a recording medium that has the overlapped signal obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing recorded on it, said overlapped signal is read with respect to the original signal for the contents having plural channels;

from the read overlapped signal, the reproduction signals of the channels are generated;
from the generated reproduction signals, said copyright information of the channels is detected;

if said detected copyright information is the same for said two or more channels, the reproduction signals of the channels are output.

5. The reproduction method described in Claim 4 characterized by the fact that the overlapped signal is read from the recording medium that has the overlapped signal obtained by overlapping the copyright information containing the same copying control information on at least the video channel and the audio channel by means of electronic watermark processing, recorded on it.

6. The reproduction method described in Claim 5 characterized by the following facts:
detection is made on whether said recording medium is read-only, and
based on the detection result and the detection result of said copyright information, the output of the reproduction signals of the channels is controlled.

7. A type of recording medium characterized by the fact that it has the overlapped signal having the copyright information obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing recorded with respect to the original signal for the contents having plural channels.

8. The recording medium described in Claim 7 characterized by the fact that it has the overlapped signal obtained by overlapping the copyright information containing the same copying control information on at least the video channel and the audio channel.

9. A type of recording medium characterized by the fact that it has the overlapped signal having the ID information indicating that the contents are the same overlapped on two or more channels by means of electronic watermark processing recorded with respect to the original signal for the contents having plural channels.

10. The recording medium described in Claim 9 characterized by the fact that it has the overlapped signal obtained by overlapping the same ID information at least on the video channel and audio channel recorded on it.

11. The recording medium described in Claim 9 characterized by the fact that it has the overlapped signal obtained by overlapping the copyright information containing the same copying control information on two or more channels recorded on it.

12. A type of reproduction device characterized by the fact that it has
a read means for reading the overlapped signal from a recording medium that has said overlapped signal obtained by overlapping an ID information indicating that the contents are the same on two or more channels by means of electronic watermark processing, recorded with respect to the original signal for the contents having plural channels,

a reproduction means that generates the reproduction signals of the channels from said read overlapped signal,

an ID detecting means that detects said ID information of the channels from the generated reproduction signals,

and a control means that outputs the reproduction signals of the channels when said ID information detected with said ID information detecting means is the same for said two or more channels.

13. The reproduction device described in Claim 12 characterized by the fact that said read means reads said overlapped signal from the recording medium that has the overlapped signal obtained by overlapping the ID information indicating that the contents are the same on at least the video channel and audio channel by means of the electronic watermark processing recorded on it.

14. A reproduction method characterized by the following facts:
 from a recording medium that has the overlapped signal obtained by overlapping the ID information indicating that the contents are the same on two or more channels by means of electronic watermark processing recorded on it, said overlapped signal is read with respect to the original signal for the contents having plural channels;

from the read overlapped signal, the reproduction signals of the channels are generated;
 from the generated reproduction signals, said ID information of the channels is detected;
 if said detected ID information is the same for said two or more channels, the reproduction signals of the channels are output.

15. The reproduction method described in Claim 14 characterized by the fact that the overlapped signal is read from the recording medium that has the overlapped signal obtained by overlapping the ID information indicating that the contents are the same on at least the video channel and the audio channel by means of electronic watermark processing recorded on it. /3

16. A type of signal processing device characterized by the fact that it has
 an input means for inputting the overlapped signal obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing with respect to the original signal for the contents having plural channels,

a reproduction means that generates the reproduction signals of the channels from said input overlapped signal,

a copyright information detecting means that detects said copyright information of the channels from the generated reproduction signals,

and a control means that outputs the reproduction signals of the channels when said copyright information detected with said copyright information detecting means is the same for said two or more channels.

17. The signal processing device described in Claim 16 characterized by the fact that said input means inputs said overlapped signal obtained by overlapping the copyright information containing the same copying control information on at least the video channel and audio channel by means of the electronic watermark processing.

18. A signal processing method characterized by the following facts:
 the overlapped signal obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing is input with respect to the original signal for the contents having plural channels;

the reproduction signals of the channels are generated from said input overlapped signal;
 said copyright information of the channels is detected from the generated reproduction signals;

... and the reproduction signals of the channels are output when said detected copyright information is the same for said two or more channels.

19. The signal processing method described in Claim 18 characterized by the fact that said overlapped signal obtained by overlapping the copyright information containing the same copying control information on at least the video channel and audio channel by means of the electronic watermark processing is input.

20. A type of reproduction device characterized by the fact that it has
an input means for inputting the overlapped signal obtained by overlapping an ID information indicating that the contents are the same on two or more channels by means of electronic watermark processing with respect to the original signal for the contents having plural channels,

a reproduction means that generates the reproduction signals of the channels from said input overlapped signal,

an ID detecting means that detects said ID information from the generated reproduction signals,

and a control means that outputs the reproduction signals of the channels when said ID information detected with said ID information detecting means is the same for said two or more channels.

21. The reproduction device described in Claim 20 characterized by the fact that said input means inputs said overlapped signal obtained by overlapping the ID information indicating that the contents are the same on at least the video channel and audio channel by means of the electronic watermark processing.

22. A signal processing method characterized by the following facts:
the overlapped signal obtained by overlapping the ID information indicating that the contents are the same on two or more channels by means of electronic watermark processing, is input with respect to the original signal for the contents having plural channels;

the reproduction signals of the channels are generated from said input overlapped signal;

said ID information is detected from the generated reproduction signals;

... and the input overlapped signal is output when said detected ID information is the same for said two or more channels.

23. The signal processing method described in Claim 22 characterized by the fact that said overlapped signal obtained by overlapping the ID information indicating that the contents are the same on at least the video channel and audio channel by means of the electronic watermark processing is input.

Detailed explanation of the invention

[0001]

Technical field of the invention

The present invention pertains to a type of reproduction device and method, a type of recording medium, as well as a type of signal processing device and signal processing method. More specifically, this invention pertains to a type of reproduction device with improved restriction of reproduction against illegal copying, piracy action, etc.

[0002]

Prior art

As internet use, DVD (digital video disk), digital satellite broadcasting, etc. become popular, infringement on the copyright due to illegal copying of the so-called digital author has become a problem.

[0003]

In order to prevent copying of the digital author, for example, CGMS (Copy Generation Management System) or another system has been adopted to perform control of generation copies. However, for the CGMS system, the copy control signal can be altered easily. This is undesirable. Also, in order to adequately prevent the illegal copying, that is, the so-called piracy action, it is necessary to apply restrictions in reproduction in addition to restriction on recording (copying) in the recording operation.

[0004]

Problems to be solved by the invention

On the other hand, in recent years, the technology known as electronic watermark processing, which can hide any information in digital data, has attracted much attention. In electronic watermark processing, the information known as the watermark is hidden as noise in the portion of said digital data that is not important for human interpretation.

[0005]

By means of said electronic watermark processing, the hidden watermark cannot be easily removed, and detection of said watermark can be performed with either a digital interface or an analog interface. Consequently, it is possible to make use of said watermark as the copying control information pertaining to restriction of copying generation.

[0006]

Table 1 lists the relationship among the medium type of the disk-shaped recording medium, the CGMS-D (Copy Generation Management System-Digital) signal in said CGMS system, and the watermark information when the watermark is used as copying control information.

[0007]

Table 1.

Read Only Disc		Rewritable Disc	
CGMS-D	Watermark	CGMS-D	Watermark
(0,0)	non-marked	(0,0)	non-marked
	copy-free		copy-free
(1,1)	non-marked	(1,1)	non-marked
	never-copy		no-more-copy
(1,0)	non-marked	(1,0)	non-marked
	one-copy		one-copy

[0008]

Here, the media types include the read only disk (hereinafter to be referred to as ROM disk) and the rewritable disk (hereinafter to be referred to as RAM disk).

[0009]

Also,, as far as the CGMS-D signal is concerned, there are three types of signals, that is, (0,0), (1,1) and (1,0). They are binary representations. Here, (0,0) indicates no copy restriction; (1,1) represents copy prohibition; and (1,0) represents copying restricted to the first generation.

[0010]

In addition, as far as the watermark information is concerned, "non-marked" indicates the state in which no mark is inserted at all. For any of the above listed media types, and for all of said (0,0), (1,1) and (1,0) of CGMS-D, there are disks of said non-marked format. Also, for said watermark information, it is taken as "copy-free" in the case of display for said state (0,0) of CGMS-D, and it is taken as "one-copy" in the case of display for said state (1,0).

[0011]

Also, for the watermark, it is taken as "never-copy" for the ROM disk and it is taken as "no-more-copy" for the RAM disk in the case of display for said state (1,1) of CGMS-D. That is,

the watermark of "never-copy" is used only for the read-only ROM disk, and the watermark of "no-more-copy" is used only for the RAM disk that allows recording.

[0012]

For a RAM disk, "no-more-copy" indicates that this disk is in the state that copying has been made from said ROM disk or RAM disk of "one-copy." That is, when copying is performed from a disk of "one-copy" to the RAM disk, the watermark of "one-copy" is changed to "no-more-copy."

[0013]

In the following, Table 2 lists examples of the disks prepared by illegal copying.

[0014]

Table 2.

Media Type	Watermark
Read Only Disc	no-more-copy
Rewritable Disc	never-copy

[0015]

As listed in Table 2, when the watermark of "no-more-copy" is detected from a ROM disk, because this watermark of "no-more-copy" is a watermark used only for a RAM disk, this disk becomes an illegal copy disk. For example, if a RAM disk attached with "no-more-copy" watermark is to be used as is in stamping for mass production, it becomes a so-called piracy disk.

[0016]

Also, when the watermark of "never-copy" is detected, because the watermark of "never-copy" is a watermark only for a ROM disk, this disk becomes an illegal copy disk.

[0017]

DVD reproduction device (100) shown in Figure 4 is proposed for restricting reproduction of the DVD disk with illegal copying by means of the watermark as said copying control information.

[0018]

This DVD reproduction device (100) can be used preferably as a system for a personal

computer. It is composed of DVD driver (102) for reading the signal recorded on DVD (101), and reproduction processing circuit (103) for performing reproduction treatment for the signal read from DVD driver (102), which are connected with a dedicated cable or bus.

[0019]

On DVD (101), in the data region, the video signal of the movie pictures and still pictures and the audio signal of the music and voice, etc. are recorded as MPEG data compressed in the MPEG (moving picture coding experts group) system. On said DVD (101), for said video signal, the information for said watermark is recorded as MPEG data overlapped by means of electronic watermark processing.

[0020]

In addition, on DVD (101), the media type information as sub-code information and said CGMS-D signal are recorded. Here, the media type information is an information indicating whether the disk is a read-only ROM disk or a recordable RAM disk. Also, a CGMS-D signal is inserted in said MPEG data, and it can be detected from both the video signal and the audio signal.

[0021]

DVD driver (102) has an optical pickup not shown in the figure for reading said MPEG data and media type information as a bit stream signal from DVD (101), and sending them to reproduction processing circuit (103). This bit stream signal has said MPEG data and media type information scrambled with CSS (Contents Scramble System), and in this state, it is transmitted to reproduction processing circuit (103).

[0022]

Here, reproduction processing circuit (103) has CSS decoder (104), MPEG decoder part (105), media type decoder (106), watermark (WM) detecting/re-encoding part (107), output control part (108), switches (111), (112), etc. These blocks have a constitution contained in a PC card or the like.

[0023]

Then, in reproduction processing circuit (103) having said bit stream signal input to it, CSS decoder (104) makes use of the cryptographic keys to perform the prescribed recognition treatment. If a correct recognition is not made, said CSS scramble is not decoded, and the reproduction processing thereafter cannot be performed. Then, for CSS decoder (104), when said

recognition is performed correctly with the cryptographic keys, the CSS scramble is decoded, said MPEG data and media type information are taken out and are sent to MPEG decoder part (105) and medium type decoder (106).

[0024]

In MPEG decoder part (105), input MPEG data is decoded, and it is separated to the audio data and the video data having the watermark overlapped on it. In MPEG decoder part (105), for the audio data, after D/A conversion is performed, it is output to switch (110, and the video data with the watermark overlapped on it (hereinafter to be referred to as overlapped video data) is output to WM detecting/re-encoding part (107).

[0025]

In WM detecting/re-encoding part (107), the watermark is detected from said overlapped video data, and the information indicating said type of "non-marked," "copy-free," "never-copy," "no-more-copy" or "one-copy" is output to output control part (108). WM detecting/re-encoding part (107) functions corresponding to the result of detection of said watermark. When the watermark is "one-copy," it performs re-encoding processing for said video data so that said watermark becomes "no-more-copy," and the processed signal is subject to D/A conversion, and is then sent to switch (112). When the watermark is other than "one-copy," WM detecting/re-encoding part (107) does not perform re-encoding processing, and the overlapped video data is subject to D/A conversion, and is sent to switch (112).

[0026]

On the other hand, medium type decoder (106) decodes said media type information, and outputs the information indicating whether DVD (101) for reproduction is a ROM disk or RAM disk to output control part (108).

[0027]

On the basis of the various types of information input from medium type decoder (106) and WM detecting/re-encoding part (107), output control part (108) controls ON/OFF of switches (111), (112). More specifically, output control part (108) performs operation on the basis of the various types of information from medium type decoder (106) and WM detecting/re-encoding part (107). When the media type of DVD (101) is "ROM type" and the watermark is "no-more-copy," or when the media type is "RAM disk" and the watermark is "never-copy," it takes the case as illegal copying, and it controls to turn OFF said switches (111), (112), while the audio signal and the overlapped video signal are not output.

[0028]

However, for said DVD reproduction device (100), the following problems have been pointed out. That is, as change of the watermark is absolutely impossible, for example, as the reproduction signal of DVD driver (102) is fetched through the bus, the information of the watermark is changed, so that the watermark is changed to "non-marked." In this case, there is no means to detect such change in DVD reproduction device (100).

[0029]

Also, in DVD reproduction device (100), because only said information of the watermark can be taken as reference, it is weak against the attack due to altering in the aforementioned piracy action, and DVD (101) prepared as an illegal copy may be reproduced as it is. This is undesirable.

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[0030]

In addition, in DVD reproduction device (100), because the watermark is not overlapped on the output audio signal, for example, when reproduction is performed for DVD (101) having contents of a movie recorded on it, illegal copying of the sound track may be performed, and a BGV software may be formed by means of audio after-recording unauthorized by the right owner.

[0031]

The purpose of this invention is to solve the aforementioned problems of the conventional methods by providing a type of reproduction device and method, a type of recording medium, as well as a type of signal processing device and signal processing method characterized by the fact that it allows a highly reliable restriction of reproduction against altering the contents by illegal copying and piracy action, etc.

[0032]

Means to solve the problems

In order to realize the aforementioned purpose, this invention provides a type of reproduction device characterized by the fact that it has a read means for reading the overlapped signal from a recording medium that has said overlapped signal obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing, recorded with respect to the original signal for the contents having plural channels, a reproduction means that generates the reproduction signals of the channels from said read

overlapped signal, a copyright information detecting means that detects said copyright information of the channels from the generated reproduction signals, and a control means that outputs the reproduction signals of the channels when said copyright information detected with said copyright information detecting means is the same for said two or more channels.

[0033]

In the reproduction device, when the copyright information detected with the copyright information detecting means is the same for the two or more channels, the reproduction signals of the channels are output.

[0034]

In order to realize the aforementioned purpose, this invention provides a reproduction method characterized by the following facts: from a recording medium that has the overlapped signal obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing recorded on it, said overlapped signal is read with respect to the original signal for the contents having plural channels; from the read overlapped signal, the reproduction signals of the channels are generated; from the generated reproduction signals, said copyright information of the channels is detected; if said detected copyright information is the same for said two or more channels, the reproduction signals of the channels are output.

[0035]

In this reproduction method, the reproduction signals of plural channels are generated from the overlapped signal read from the recording medium; plural copyright information pieces are detected from the generated reproduction signals, and if these copyright information pieces are identical to each other, the reproduction signals of the channels are output.

[0036]

In order to realize the aforementioned purpose, this invention provides a type of recording medium characterized by the fact that it has the overlapped signal having the copyright information obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing recorded with respect to the original signal for the contents having plural channels.

[0037]

In order to realize the aforementioned purpose, this invention provides a type of recording medium characterized by the fact that it has the overlapped signal having the ID information indicating that the contents are the same overlapped on two or more channels by means of electronic watermark processing recorded with respect to the original signal for the contents having plural channels.

[0038]

Also, in order to realize the aforementioned purpose, this invention provides a type of reproduction device characterized by the fact that it has a read means for reading the overlapped signal from a recording medium that has said overlapped signal obtained by overlapping an ID information indicating that the contents are the same on two or more channels by means of electronic watermark processing, recorded with respect to the original signal for the contents having plural channels, a reproduction means that generates the reproduction signals of the channels from said read overlapped signal, an ID detecting means that detects said ID information of the channels from the generated reproduction signals, and a control means that outputs the reproduction signals of the channels when said ID information detected with said ID information detecting means is the same for said two or more channels.

[0039]

In the reproduction device, when the ID information detected with the ID information detecting means is the same for the two or more channels, the reproduction signals of the channels are output.

[0040]

Also, in order to realize the aforementioned purpose, this invention provides a reproduction method characterized by the following facts: from a recording medium that has the overlapped signal obtained by overlapping the ID information indicating that the contents are the same on two or more channels by means of electronic watermark processing recorded on it, said overlapped signal is read with respect to the original signal for the contents having plural channels; from the read overlapped signal, the reproduction signals of the channels are generated; from the generated reproduction signals, said ID information of the channels is detected; if said detected ID information is the same for said two or more channels, the reproduction signals of the channels are output.

[0041]

In this reproduction method, the reproduction signals of plural channels are generated from the overlapped signal read from the recording medium; plural ID information pieces are detected from the generated reproduction signals, and if these ID information pieces are identical to each other, the reproduction signals of the channels are output.

[0042]

In order to realize the aforementioned purpose, this invention provides a type of signal processing device characterized by the fact that it has an input means for inputting the overlapped signal obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing, with respect to the original signal for the contents having plural channels, a reproduction means that generates the reproduction signals of the channels from said input overlapped signal, a copyright information detecting means that detects said copyright information of the channels from the generated reproduction signals, and a control means that outputs the reproduction signals of the channels when said copyright information detected with said copyright information detecting means is the same for said two or more channels.

[0043]

In the signal reproduction device, when the copyright information detected with the copyright information detecting means is the same for the two or more channels, the reproduction signals of the channels are output.

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[0044]

In order to realize the aforementioned purpose, this invention provides a signal processing method characterized by the following facts: the overlapped signal obtained by overlapping the same copyright information on two or more channels by means of electronic watermark processing, is input with respect to the original signal for the contents having plural channels; the reproduction signals of the channels are generated from said input overlapped signal; said copyright information of the channels is detected from the generated reproduction signals; and the reproduction signals of the channels are output when said detected copyright information is the same for said two or more channels.

[0045]

In this signal processing method, the reproduction signals of plural channels are generated from the input overlapped signal. From the generated reproduction signal, plural

copying control information pieces are detected. If these copying control information pieces are identical to each other, the reproduction signals of the various channels are output.

[0046]

In order to realize the aforementioned purpose, this invention provides a type of reproduction device characterized by the fact that it has an input means for inputting the overlapped signal obtained by overlapping an ID information indicating that the contents are the same on two or more channels by means of electronic watermark processing, with respect to the original signal for the contents having plural channels, a reproduction means that generates the reproduction signals of the channels from said input overlapped signal, an ID detecting means that detects said ID information from the generated reproduction signals, and a control means that outputs the reproduction signals of the channels when said ID information detected with said ID information detecting means is the same for said two or more channels.

[0047]

In the signal processing device, when the ID information detected with the ID information detecting means is the same for the two or more channels, the reproduction signals of the channels are output.

[0048]

In addition, in order to realize the aforementioned purpose, this invention provides a signal processing method characterized by the following facts: the overlapped signal obtained by overlapping the ID information indicating that the contents are the same on two or more channels by means of electronic watermark processing is input with respect to the original signal for the contents having plural channels; the reproduction signals of the channels are generated from said input overlapped signal; said ID information is detected from the generated reproduction signals; and the input overlapped signal is output when said detected ID information is the same for said two or more channels.

[0049]

In the signal processing method, reproduction signals of plural channels are generated from the input overlapped signal, and plural ID information pieces are detected from the generated reproduction signals. When these ID information pieces are identical to each other, the reproduction signals of the channels are output.

[0050]

Embodiments of the invention

In the following, embodiments of this invention will be explained in more detail with reference to the figures. For DVD reproduction device (10) shown in Figure 1, reproduction of DVD prepared by illegal copying can be prevented by means of watermark. It is composed of DVD driver (2) for reading the signal recorded on DVD (1) and reproduction processing circuit (3) for the signal read from DVD driver (2), which are connected with a dedicated cable or bus.

[0051]

On DVD (1), in the data region, the video signal of the movie pictures and still pictures and the audio signal of the music and voice, etc. are recorded as MPEG data compressed in the MPEG (moving picture coding experts group) system. On said DVD (1), for said video signal and audio signal, the information for said watermark is recorded as the copy generation information listed in said Table 1 overlapped by means of electronic watermark processing.

[0052]

On DVD (1), the information for the same watermark is overlapped on said video signal and audio signal, respectively. That is, when the watermark for "one-copy" is overlapped on the video signal, the watermark for "one-copy" is also overlapped on the audio signal.

[0053]

Also, for the video signal and audio signal, when the information for the same watermark is overlapped, the overlapping schemes are different for them. In this way, when a piracy action is to be made by changing the reproduction signal from DVD (1), the perpetrator has to think out the schemes in attacking two types of watermarks for video and audio at the same time. Consequently, the ability to resist the intention of altering is higher than the conventional DVD (101) that has the information of the watermark overlapped only on the video signal.

[0054]

In addition, on DVD (1), the media type information as sub-code information and said CGMS-D signal are recorded. Here, the media type information is an information indicating whether the disk is a read-only ROM disk or a recordable RAM disk. Also, a CGMS-D signal is inserted in said MPEG data, and it can be detected from both the video signal and the audio signal.

[0055]

DVD driver (2) has an optical pickup not shown in the figure for reading said MPEG data and media type information as a bit stream signal from DVD (1), and sending them to reproduction processing circuit (3). This bit stream signal has said MPEG data and media type information scrambled with CSS (Contents Scramble System), and in this state, it is transmitted to reproduction processing circuit (3).

[0056]

Here, reproduction processing circuit (3) has CSS decoder (4), MPEG decoder part (5), media type decoder (6), watermark (WM) detecting/re-encoding part (7) for the video signal, WM detecting/re-encoding part (8) for the audio signal, output control part (9), switches (11), (12), etc. These blocks have a constitution contained in PC card or the like.

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[0057]

Then, in reproduction processing circuit (3) having said bit stream signal input to it, CSS decoder (4) makes use of the cryptographic keys to perform the prescribed recognition treatment. If a correct recognition is not made, said CSS scramble is not decoded, and the reproduction processing thereafter cannot be performed. Then, for CSS decoder (4), when said recognition is performed correctly with the cryptographic keys, CSS scramble is decoded, said MPEG data and media type information are taken out and are sent to MPEG decoder part (5) and medium type decoder (6).

[0058]

In MPEG decoder part (5), input MPEG data is decoded, and it is separated to the video data having the watermark overlapped on it (hereinafter to be referred to as overlapped video data) and the audio mark having the watermark overlapped on it (hereinafter to be referred to as overlapped audio data). In MPEG decoder part (5), the overlapped video data is output to WM detecting/re-encoding part (7), and the overlapped audio data is output to WM detecting/re-encoding part (8).

[0059]

In WM detecting/re-encoding part (7), from said overlapped video data, the watermark is detected, and the information indicating said type of "non-marked," "copy-free," "never-copy," "no-more-copy" or "one-copy" is output to output control part (9). WM detecting/re-encoding part (7) works corresponding to the result of detection of said watermark. When the watermark is "one-copy," it performs re-encoding processing for said video data so that said watermark

becomes "no-more-copy," and the processed signal is subject to D/A conversion, and is then sent to switch (12). When the watermark is other than "one-copy," WM detecting/re-encoding part (7) does not perform re-encoding processing, and the overlapped video data is subject to D/A conversion, and is sent to switch (12).

[0060]

In WM detecting/re-encoding part (8), the same processing is performed as said WM detecting/re-encoding part (7). That is, in WM detecting/re-encoding part (8), from said overlapped video data, the watermark is detected, and the information indicating said type of "non-marked," "copy-free," "never-copy," "no-more-copy" or "one-copy" is output to output control part (9). WM detecting/re-encoding part (8) operates corresponding to the result of detection of said watermark. When the watermark is "one-copy," it performs re-encoding processing for said audio data so that said watermark becomes "no-more-copy," and the processed signal is subject to D/A conversion, and is then sent to switch (11). When the watermark is other than "one-copy," WM detecting/re-encoding part (8) does not perform re-encoding processing, and the overlapped video data is subject to D/A conversion, and is sent to switch (11).

[0061]

Medium type decoder (6) decodes said media type information, and outputs the information indicating whether DVD (1) for reproduction is a ROM disk or RAM disk to output control part (9).

[0062]

On the basis of the various types of information input from medium type decoder (6), WM detecting/re-encoding part (7), and WM detecting/re-encoding part (8), output control part (9) controls ON/OFF of switches (11), (12). More specifically, output control part (9) performs operation on the basis of the various types of information from medium type decoder (6), WM detecting/re-encoding part (7) and WM detecting/re-encoding part (8). When the media type of DVD (1) is "ROM type" and the watermark is "no-more-copy," or when the media type is "RAM disk" and the watermark is "never-copy" as listed in Table 2, it takes the case as illegal copying, and it controls to turn OFF said switches (11), (12), while the overlapped audio signal and the overlapped video signal are not output.

[0063]

Also, output control part (9) works on the basis of the information from WM detecting/re-encoding part (7) and WM detecting/re-encoding part (8). When the detected watermarks are different from each other, it is taken as an illegal copy, and control is performed to turn OFF switches (11), (12), and the audio signal and the overlapped video signal are not output. For example, it happens when the watermark is "non-marked" for the video and the watermark is "no-more-copy" for the audio. In this case, it is acknowledged that there has been an action to alter the watermark of the video.

[0064]

Output control part (9) works on the basis of the information from WM detecting/re-encoding part (7) and WM detecting/re-encoding part (8). when the media type and watermark of DVD (1) do not fit the combinations listed in Table 2, and when the detected watermarks are identical to each other, it controls to turn ON switches (11), (12), and outputs the overlapped audio signal and the overlapped video signal to the outside.

[0065]

In this way, in reproduction processing circuit (3), in addition to the judgment on the piracy copy listed in Table 2, an item of "whether the watermarks of the video and audio are in agreement with each other?" is added. Consequently, even for the legal combination of the watermarks of audio and video listed in Table 1, if the watermarks are different from each other, the reproduction restriction is applied, and the audio and video signals are not output. Consequently, the restriction on reproduction of illegal copy can be improved.

[0066]

In the aforementioned example, for DVD (1), the information about the watermark as the copy generation information listed in Table 1 is subject to electronic watermark processing so that it is overlapped on said video signal and audio signal, respectively. However, in addition to said information about the watermark, one may also overlap by performing electronic watermark processing for the ID information indicating that the contents are the same.

[0067]

That is, for DVD (1), by overlapping said ID information on said video signal and audio signal by means of electronic watermark processing, in reproduction processing circuit (3), another judgment item of "whether the ID information of video and that of audio are in

agreement with each other?" is added. As a result, reproduction restriction can be performed more reliably.

[0068]

In addition, when the audio signal of DVD (1) has 5-1 stereo or other multi-channels, one may overlap the information about the watermark and/or said ID information on each channel by means of electronic watermark processing. In this case, WM detecting/re-encoding part (8) may perform said watermark detection and other processing for each channel.

[0069]

In the following, another embodiment of this invention will be explained with reference to Figure 2. In this case, the same part numbers as those of Figure 1 are adopted. Using watermark in the same way as in said DVD reproduction device (10), DVD reproduction device (20) shown in Figure 2 performs restriction on reproduction of DVD disk prepared by illegal copying. It is composed of DVD driver (2) for reading the signal recorded on DVD (1) and reproduction processing circuit (3A) for performing reproduction processing of the signal read from DVD driver (2), which are connected by means of reproduction processing circuit (3A) and a dedicated cable or bus.

[0070]

Here, as DVD (1) and DVD driver (2) are of the same types as DVD (1) and DVD driver (2) shown in Figure 1, they will not be explained again.

[0071]

Reproduction processing circuit (3A) is composed of CSS decoder (4), MPEG decoder (5), medium type decoder (6), WM detecting/re-encoding part (7) for the video signal, WM detecting/re-encoding part (8) for the audio signal, CGMS-D decoder (13) for the video signal, CGMS-D decoder (14) for the audio signal, output control part (15) and switches (11), (12). These blocks have a configuration contained in the so-called PC card or the like.

[0072]

CSS decoder (4), medium type decoder (6), WM detecting/re-encoding part (7), and WM detecting/re-encoding part (8) are of the same types as those shown in Figure 1. Consequently, they will not be explained again.

[0073].

MPEG decoder (5) decodes the input MPEG data, and the data is separated to overlapped video data and overlapped audio data. Said MPEG decoder (5) outputs the overlapped video data to WM detecting/re-encoding part (7) and CGMS-D decoder (13), and it outputs overlapped audio data to WM detecting/re-encoding part (8) and CGMS-D decoder (14).

[0074]

CGMS-D decoder (13) decodes the information about CGMS-D from the input overlapped video data, and sends the information about the type of said (0,0), (1,1) or (1,0) to output control part (15). Similarly, CGMS-D decoder (14) also decodes the information about CGMS-D from the input overlapped audio data, and it sends the information about the type of said (0,0), (1,1), (1,0) to output control part (15).

[0075]

On the base of the information input from medium type decoder (6), WM detecting/re-encoding part (7), WM detecting/re-encoding part (8), CGMS-D decoder (13) and CGMS-D decoder (14), output control part (15) controls ON/OFF of switches (11), (12). More specifically, output control part (9) works on the basis of the information from medium type decoder (6), WM detecting/re-encoding part (7) and WM detecting/re-encoding part (8). When the media type of DVD (1) is "ROM disk" and the watermark is "no-more-copy," or when the media type is "RAM disk" and the watermark is "never-copy" as a combination listed in Table 2, it is taken as an illegal copy, and control is performed to turn OFF switches (11), (12), so that the overlapped audio signal and overlapped video signal are not output.

[0076]

Also, output control part (15) works on the basis of the information from WM detecting/re-encoding part (7) and WM detecting/re-encoding part (8). When the detected watermarks are different from each other, for example, when the watermark for video is "non-marked" and the watermark for audio is "no-more-copy," it is taken as an illegal copy, and control is performed to turn OFF switches (11), (12), so that the overlapped audio signal and the overlapped video signal are not output.

[0077]

In addition, output control part (15) works on the basis of the information from CGMS-D decoder (13) and CGMS-D decoder (14). When the CGMS-D for video and the CGMS-D for audio are different from each other, it is taken as an illegal copy, and control is performed to turn

OFF switches (11), (12), so that the overlapped audio signal and the overlapped video signal are not output.

[0078]

In addition, output control part (15) works on the basis of the information from WM detecting/re-encoding parts (7), (8) and CGMS-D decoders (13), (14). When the corresponding relationship between the CGMS-D and the watermark is checked, and it is found that they do not match each other, for example, suppose CGMS-D is (0,0) and the watermark is "one-copy," it is taken as an illegal copy, and control is performed to turn OFF switches (11), (12), so that the overlapped audio signal and the overlapped video signal are not output.

/10

[0079]

With said processing schemes, output control part (15) controls such that only when the media type and the watermark of DVD (1) are not any combination listed in Table 2, the watermarks are the same, and the CGMS-D are also the same, and further the watermark and the CGMS-D match each other, are switches (11), (12) turned ON, and the overlapped audio signal and the overlapped video signal are output to the outside.

[0080]

In this way, in reproduction processing circuit (3A), in addition to the judgment items with reproduction particular circuit (3), the items of "whether the CGMS-D are in agreement with each other?" and "whether the watermark and the CGMS-D are in agreement with each other?" are added. Consequently, it is also possible to detect any altering action for CGMS-D, and at the same time, it is possible to beef up the ability against the altering action for the watermark and CGMS-D.

[0081]

In the aforementioned embodiment, for DVD (1), the information about the watermark as the copy generation information listed in Table 1 is subject to electronic watermark processing so that it is overlapped on said video signal and audio signal, respectively. However, in addition to said information about the watermark, one may also overlap by performing the electronic watermark processing for the ID information indicating that the contents are the same.

[0082]

In addition, when the audio signal of DVD (1) has 5-1 stereo or other multi-channels, one may overlap the information about the watermark and/or said ID information on each channel by

means of electronic watermark processing, or one may insert the information about said CGMS-D on each channel. In this case, WM detecting/re-encoding part (8) may perform said watermark detection and other processing for each channel, and CGMS-D decoder (14) may perform decoding for said CGMS-D in each channel.

[0083]

In said embodiments, DVD is used as the recording medium. However, this invention is not limited to the DVD. It also applies on CD (Compact Disk), MD (Mini Disk), and other types of optical disks and optomagnetic disks.

[0084]

In the aforementioned embodiments, an explanation has been made on the DVD reproduction device. However, this invention also applies in the case of recording restriction in the case of DVD recording. In the following, explanation will be made on the embodiment of the recording device of this invention.

[0085]

Recording device (30) shown in Figure 3 is composed of WM detecting/re-encoding parts (7), (8), switches (11), (12), output control part (31), and recording part (32). Recording device (30) is connected to optical disk reproduction device (120) that reproduces DVD (1) and outputs the overlapped video data and overlapped audio data.

[0086]

In WM detecting/re-encoding part (7), from said overlapped video data input from optical disk reproduction device (120), the watermark is detected, and the information indicating said type of "non-marked," "copy-free," "never-copy," "no-more-copy" or "one-copy" is output to output control part (31). WM detecting/re-encoding part (7) works corresponding to the result of detection of said watermark. When the watermark is "one-copy," it performs re-encoding processing for said video data so that said watermark becomes "no-more-copy," and the processed signal is subject to D/A conversion, and is then sent to switch (12). When the watermark is other than "one-copy," WM detecting/re-encoding part (7) does not perform re-encoding processing, and the overlapped video data is subject to D/A conversion, and is sent to switch (12).

[0087]

In WM detecting/re-encoding part (8), the same processing is performed as said WM detecting/re-encoding part (7). That is, in WM detecting/re-encoding part (8), from said overlapped video data input from optical disk reproduction device (120), the watermark is detected, and the information indicating said type of "non-marked," "copy-free," "never-copy," "no-more-copy" or "one-copy" is output to output control part (31). WM detecting/re-encoding part (8) works corresponding to the result of detection of said watermark. When the watermark is "one-copy," it performs re-encoding processing for said audio data so that said watermark becomes "no-more-copy," and the processed signal is subject to D/A conversion, and is then sent to switch (11). When the watermark is other than "one-copy," WM detecting/re-encoding part (8) does not perform re-encoding processing, and the overlapped video data is subject to D/A conversion, and is sent to switch (11).

[0088]

On the basis of the various types of information input from WM detecting/re-encoding part (7) and WM detecting/re-encoding part (8), output control part (31) controls ON/OFF of switches (11), (12). More specifically, output control part (31) performs operation on the basis of the various types of information from WM detecting/re-encoding part (7) and WM detecting/re-encoding part (8), and it determines whether the watermarks are in agreement with each other. When they are not in agreement with each other, it takes the case as illegal copying, and it controls to turn OFF said switches (11), (12), while the overlapped audio signal and the overlapped video signal are not output to recording part (32). On the other hand, if the watermarks are in agreement with each other, when the type of the watermark is "never-copy" or "no-more-copy," output control part (31) controls to turn OFF switches (11), (12), so that the overlapped audio signal and the overlapped video signal are not output to recording part (32).

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[0089]

When the watermark type is "non-marked," "copy-free," or "one-copy," output control part (31) controls to turn ON switches (11), (12). As a result, the overlapped audio signal and the overlapped video signal are sent to recording part (32).

[0090]

Recording part (32) performs the prescribed signal processing for the output signal from WM detecting/re-encoding parts (7), (8) fed through switches (11), (12), and it records the processed signal on a RAM type optical disk.

[0091]

With said constitution, recording device (30) can perform restriction on recording on the basis of judgment of the identity of the watermarks based on the input signal.

[0092]

Effect of the invention

As explained in detail above, according to the reproduction device of this invention, when the copyright information detected with the copyright information detecting means is the same for two or more channels, because the reproduction signals of the channels are output, the control means can easily detect whether the recording medium is prepared as an illegal copy. Also, with this reproduction device, any person intending to perform altering action for the signal from the read means has to alter the copyright information for plural channels. Consequently, this system has a high resistance against such altering action.

[0093]

According to the reproduction method of this invention, reproduction signals of plural channels are generated from the overlapped signal read from the recording medium, and the plural copyright information pieces are detected from the generated reproduction signal. When the copyright information is the same, the reproduction signals of the channels are output. Consequently, it is easy to detect whether the recording medium is prepared by illegal copying. Also, according to the reproduction method, any person intending to perform altering action for the signal with respect to the contents has to alter the copyright information for the plural channels. Consequently, it has a high resistance against such altering action.

[0094]

For the recording medium of this invention, the signal with the same copyright information overlapped on two or more channels by means of electronic watermark processing is recorded with respect to the original signal for the contents having plural channels. Consequently, by judging the identity of the copyright information during reproduction of the contents, it is easy to detect whether the copy is an illegal copy. Also, for the reproduction signal of this recording medium, any person intending to perform altering action for the signal has to alter the copyright information for the plural channels. Consequently, the recording medium has a high resistance against such altering action.

[0095]

For the recording medium of this invention, the signal with the ID information indicating that the contents are the same for two or more channels is recorded by means of electronic watermark processing. Consequently, by judging the identity of the ID information during reproduction of the contents, it is easy to detect whether the copy is an illegal copy. Also, for the reproduction signal of this recording medium, any person intending to perform altering action for the reproduction signal of the recording medium has to alter the ID information for plural channels. Consequently, the recording medium has a high resistance against such altering action.

[0096]

According to the reproduction device of this invention, the control means functions such that when the ID information detected with the ID detecting means is the same for the two or more channels, the reproduction signals of the channels are output. Consequently, it is easy to detect whether the recording medium is an illegal copy. Also, with this reproduction device, any person intending to perform altering action for the signal from the read means has to alter the ID information for plural channels. Consequently, this system has a high resistance against such altering action.

[0097]

According to the reproduction method of this invention, reproduction signals of plural channels are generated from the overlapped signal read from the recording medium, and the plural ID information pieces are detected from the generated reproduction signal. When the ID information is the same, the reproduction signals of the channels are output. Consequently, it is easy to detect whether the recording medium is prepared with illegal copying. Also, according to the reproduction method, any person intending to perform altering action for the signal with respect to the contents has to alter the ID information for the plural channels. Consequently, it has a high resistance against such altering action.

[0098]

According to the signal processing device of this invention, the control means works such that when the copyright information pieces detected with the copyright information detecting means are the same for two or more channels, the reproduction signals of the channels are output. Consequently, any person intending to perform altering action for the overlapped signal has to alter the copyright information for the plural channels. Consequently, it has a high resistance against such altering action.

[0099]

According to the signal processing method of this invention, reproduction signals of plural channels are generated from the input overlapped signal, and the plural copying control information pieces are detected from the generated reproduction signal. When the copying control information is the same, the reproduction signals of the channels are output. Consequently, any person intending to perform altering action for the overlapped signal has to alter the copying control information for the plural channels. Consequently, it has a high resistance against such altering action.

[0100]

According to the signal processing device of this invention, the control means works such that when the ID information pieces detected with the ID information detecting means are the same for two or more channels, the reproduction signals of the channels are output. Consequently, any person intending to perform altering action for the overlapped signal has to alter the ID information for the plural channels. Consequently, it has a high resistance against such altering action.

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[0101]

According to the signal processing method of this invention, reproduction signals of plural channels are generated from the input overlapped signal, and the plural ID information pieces are detected from the generated reproduction signal. When the ID information is the same, the reproduction signals of the channels are output. Consequently, any person intending to perform altering action for the overlapped signal has to alter the ID information for the plural channels. Consequently, it has a high resistance against such altering action.

Brief description of the figures

Figure 1 is a block diagram illustrating the constitution of the DVD reproduction device.

Figure 2 is a block diagram illustrating another constitution of the DVD reproduction device.

Figure 3 is a block diagram illustrating an example of the constitution of the recording device.

Figure 4 is a block diagram illustrating the restriction on reproduction when a DVD is reproduced in a microcomputer system.

Brief description of part numbers

10, 20 DVD reproduction device

- 1 DVD
- 2 DVD driver
- 3, 3A Reproduction processing circuit
- 4 CSS decoder
- 5 MPEG decoder
- 6 Media type decoder
- 7, 8 WM detecting/re-encoding part
- 9, 15 Output control part
- 11, 12 Switch
- 13, 14 CGMS-D decoder
- 30 Recording device

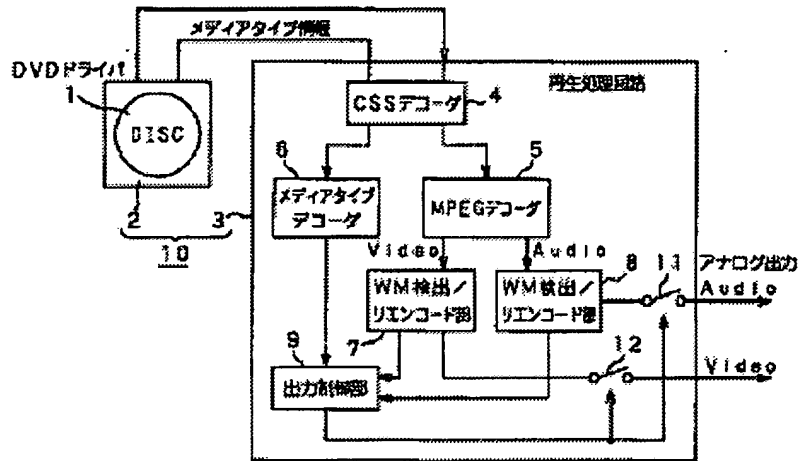


Figure 1

- Key:
- A DVD driver
 - B Media type information
 - C Reproduction processing circuit
 - D Analog output
 - 4 CSS decoder
 - 5 MPEG decoder
 - 6 Media type decoder
 - 7, 8 WM detecting/re-encoding part
 - 9 Output control part

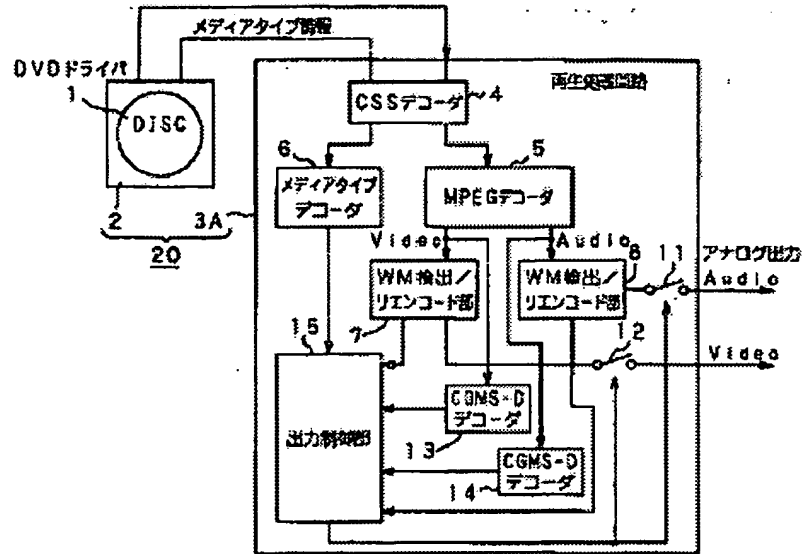


Figure 2

- Key:
- A DVD driver
 - B Media type information
 - C Reproduction processing circuit
 - D Analog output
 - 4 CSS decoder
 - 5 MPEG decoder
 - 6 Media type decoder
 - 7, 8 WM detecting/re-encoding part
 - 13, 14 CGMS-D decoder
 - 15 Output control part

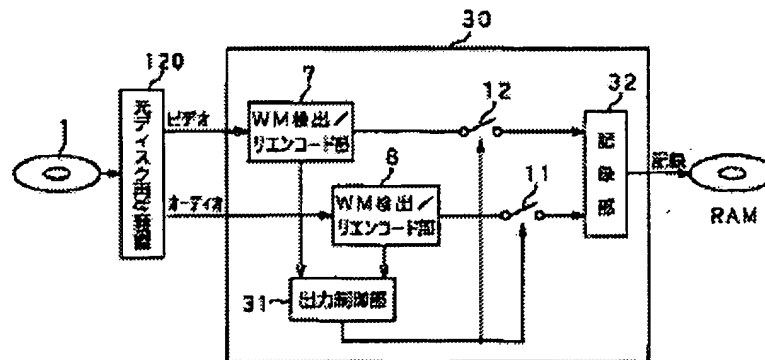


Figure 3

- Key:
- A Video
 - B Audio
 - C Recording
 - 7 WM detecting/re-encoding part

- 8 WM detecting/re-encoding part
- 31 Output control part
- 32 Recording part
- 120 Optical disk reproduction device

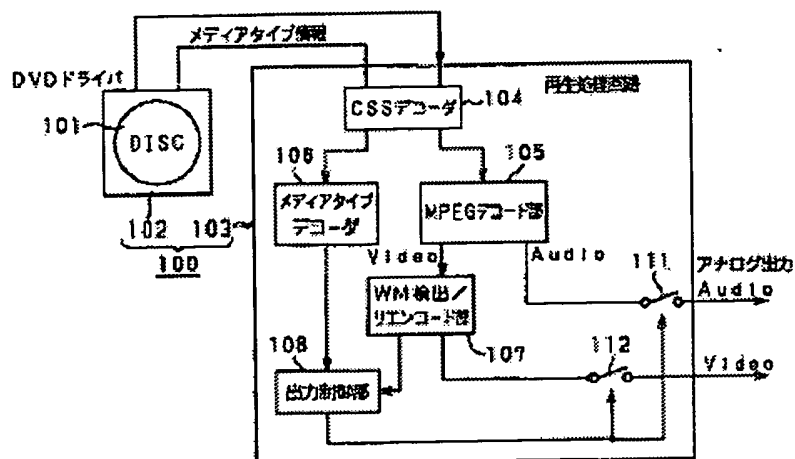


Figure 4

- Key:
- A Media type information
 - B Reproduction processing circuit
 - C Analog output
 - 101 DVD driver
 - 104 CSS decoder
 - 106 Medium type decoder
 - 105 MPEG decoder part
 - 107 WM detecting/re-encoding part
 - 108 Output control part